PATENT SPECIFICATION

DRAWINGS ATTACHED

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866,750

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International Classification:—B61c. B62d.

COMPLETE SPECIFICATION

Improvements relating to Railway Locomotives

We, D. NAPIER & SON LIMITED, a Company registered under the Laws of Great Britain, of 211 Acton Vale, London, W.3, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to railway locomotives.

According to the present invention a railway locomotive includes a reciprocating internal combustion engine arranged to operate as a pressure gas generator, and gas turbines arranged to be driven by gas so produced and to drive wheel axles, each driven wheel axle being driven by a separate gas turbine. The turbines are preferably connected in parallel each exhausting to atmosphere.

The arrangements in accordance with the invention ensure a balanced distribution torque to the respective driven axles irrespective of slight differences in effective diameter of the various wheels.

In one form of the invention there are four driven axles each driven by a separate turbine whereof all four turbines are supplied from the same internal combustion engine operating as a pressure gas generator. In another form of the invention there are six driven axles each driven by a separate gas turbine, all the gas turbines being driven by a single pressure gas generator.

In one arrangement each driven axle is parallel to the axis of its driving turbine and is driven from it through gearing having axes parallel to it. If the axle is constrained to swing about the axis of the turbine, or of one of the gears, the axle can then be resiliently mounted on the locomotive chassis. In an alternative arrangement each turbine lies with its axis in a fore-and-aft direction and drives its axle through a propeller shaft including one or more universal joints permitting relative vertical movement.

[*Price 3s. 6d.*]

When two axles are supported on a bogie the two turbines will preferably be supplied through a common duct including a rotatable coupling co-axial with the vertical axis of the bogie.

The internal combustion engine may be of any convenient type but is preferably of a type, such as that sold under the registered Trade Mark "Deltic," comprising sets of three cylinders lying along the sides of an equilateral triangle with crankshafts at the corners of the triangle, each cylinder having in it two pistons connected to different crankshafts and one co-operating with inlet ports whilst the other co-operates with exhaust ports. A compressor may be mounted within the space surrounded by the cylinders, to be driven by the engine crankshafts. Additionally or alternatively a compressor may be provided driven by an exhaust turbine.

The invention may be carried into practice in various ways but certain specific arrangements will be described by way of example with reference to the accompanying drawings, in which

Figure 1 is a side elevation, partly broken away for clarity, of a locomotive having four driving axles mounted in pairs on two bogies, each axle coupled to an individual power turbine,

Figure 2 is a fragmentary side elevation on an enlarged scale, partly in section, showing the reduction gearing between one of the turbines and its axle,

Figure 3 is a view corresponding to Figure 1 of another locomotive with six driven axles.

In each case the invention is applied to a railway locomotive or rail car incorporating an internal combustion engine 10 of the type referred to above. The engine is arranged to operate simply as a pressure gas generator, giving no mechanical output except to drive its own compressor 11 and possibly certain auxiliary services (not shown).

In the first embodiment illustrated in

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Figures 1 and 2 the locomotive is carried on two bogies 12, 13 each comprising four wheels and two axles, all four axles 14, 15, 16, 17 being driven. Each axle has its own gas turbine 18. The four wheel axles are all independently sprung and the turbines 18 are mounted on the frame or chassis of the locomotive. Each turbine is mounted with its axis in a fore-and-aft direction and drives reduction and reversing gearing 19 also having its axes fore and aft. The output from the reduction gearing drives a short propeller shaft 20 having universal joints 21 to permit vertical movement of the wheel relatively to the frame of the vehicle. The output end of the propeller shaft is coupled to a further reduction gear 22 having its axes fore and aft and terminating in a bevel gear 23 driving the axle.

Suitable ducts are provided for supplying pressure gas from the exhaust of the internal combustion engine to the inlets of the four turbines. If desired all four turbines may be supplied from a common chamber or alternatively as illustrated in Figure 1 the two turbines at one end may be supplied through a duct 27 from one end of the engine whilst the two turbines at the other end are supplied through a duct 28 from the other end of the engine, the exhausts from certain sets of cylinders being collected together in a balancing chamber 29 and fed through duct 27 to the two turbines at the corresponding end whilst the exhausts from the other cylinders are collected in another collecting chamber 30 for supply to the other two turbines.

The arrangement illustrated in Figure 3 is similar to that just described except that there are six driven axles 25 each provided with its own driving turbine 26.

In a further embodiment, not illustrated, a locomotive is provided with four driving axles as in Figure 1, each driven by an independent turbine, but the turbine is mounted with its axis parallel to that of the respective axle and connected to it through a train of gearing having axes also parallel to the axle. The complete axle with its gearing is mounted so as to be capable of sprung generally vertical movement relatively to the bogie or vehicle chassis about the axis of the turbine, thereby permitting vertical movement of the traction wheels without corresponding vertical movement of the turbine.

WHAT WE CLAIM IS:—

1. A railway locomotive including a reciprocating internal combustion engine arranged to operate as a pressure gas generator, and gas turbines arranged to be driven by gas so produced and to drive wheel axles, each driven wheel axle being driven by a separate gas turbine.

2. A railway locomotive as claimed in Claim 1 in which there are four driven axles each driven by a separate turbine whereof all four turbines are supplied from the same internal combustion engine operating as a pressure gas generator.

3. A railway locomotive as claimed in Claim 1 in which there are six driven axles each driven by a separate gas turbine, all the gas turbines being driven by a single pressure gas generator.

4. A railway locomotive as claimed in any of the preceding claims in which each driven axle is parallel to the axis of its driving turbine and is driven from the turbine through gearing having axes parallel to the turbine axis, the driven axle being resiliently mounted from the locomotive chassis.

5. A railway locomotive as claimed in any of the preceding claims 1 to 3 in which each turbine lies with is axis in a fore and aft direction and drives the respective axle through a propeller shaft including one or more universal joints permitting relative vertical movement.

6. A railway locomotive as claimed in any of the preceding claims in which the internal combustion engine includes a compressor driven by the engine crankshaft with or without a compressor driven by a separate exhaust turbine.

7. A railway locomotive substantially as described with reference to Figures 1 and 2 or Figure 3 of the accompanying drawings.

KILBURN & STRODE,
Agents for the Applicants.

PROVISIONAL SPECIFICATION

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The arrangements in accordance with the invention ensures a balanced distribution torque to the respective driven axles irrespective of slight differences in effective diameter of the various wheels.

In one form of the invention there are four driven axles each driven by a separate turbine whereof all four turbines are supplied from

the same internal combustion engine operating as a pressure gas generator. In another form of the invention there are six driven axles each driven by a separate gas turbine, all the gas turbines being driven by a single pressure gas generator.

In one arrangement each driven axle is parallel to the axis of its driving turbine and is driven from it through gearing having axes parallel to it. If the axle is constrained to swing about the axis of the turbine, or of one of the gears, the axle can then be resiliently mounted on the locomotive chassis. In an alternative arrangement each turbine lies with its axis in a fore-and-aft direction and drives its axle through a propeller shaft including one or more universal joints permitting up-and-down relative movement.

When two axles are supported on a bogie the two turbines will preferably be supplied through a common duct including a rotatable coupling co-axial with the vertical axis of the bogie.

The internal combustion engine may be of any convenient type but is preferably of a type, such as that sold under the registered trade mark "Deltic," comprising sets of three cylinders lying along the sides of an equilateral triangle with crankshafts at the corners of the triangle, each cylinder having in it two pistons connected to different crankshafts and one co-operating with inlet ports whilst the other co-operates with exhaust ports. A compressor may be mounted within the space surrounded by the cylinders, to be driven by the engine crankshafts.

The invention may be carried into practice in various ways but certain specific arrangements will be briefly described by way of example.

In each case the invention is applied to a railway locomotive or rail car incorporating an internal combustion engine of the type referred to above. The engine is arranged to operate simply as a pressure gas generator, giving no mechanical output except to drive its own compressor and possibly certain auxiliary services.

In one embodiment the locomotive is carried on two bogies each comprising four wheels and two axles all four axles being driven. Each axle has its own gas turbine mounted with its axis parallel to that of the axle and connected to it through a train of gearing having axes also lying parallel to the axle. The complete axle with its turbine and gearing may be mounted so as to be capable of sprung movement relatively to the bogie about the axis of the turbine thereby permitting some up-and-down movement of the wheel without corresponding vertical movement of the turbine.

Suitable ducts are provided for supplying pressure gas from the exhaust of the internal combustion engine to the inlets of the four turbines. If desired all four turbines may be supplied from a common chamber or alternatively the two turbines at one end may be supplied from one end of the engine whilst the two turbines at the other end are supplied from the other end of the engine, the exhausts from certain sets of cylinders being collected together in a balancing chamber and fed to the two turbines at the corresponding end whilst the exhausts from the other cylinders are collected in another collecting chamber for supply to the other two turbines.

In a further embodiment the general arrangement is similar to that already described but in this case the four wheel axles are all independently sprung and the turbines are mounted on the frame or chassis of the locomotive. Each turbine is mounted with its axis in a fore-and-aft direction and drives reduction gearing also having its axes fore and aft. The output from the reduction gearing drives a short propeller shaft having universal joints to permit up and down movement of the wheel relatively to the frame of the vehicle. The output end of the propeller shaft is coupled to a further reduction gear having its axes fore and aft and terminating in a bevel gear driving the axle.

A further arrangement is similar to that just described except that there are six driven axles each provided with its own driving turbine.

KILBURN & STRODE,
Agents for the Applicants.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

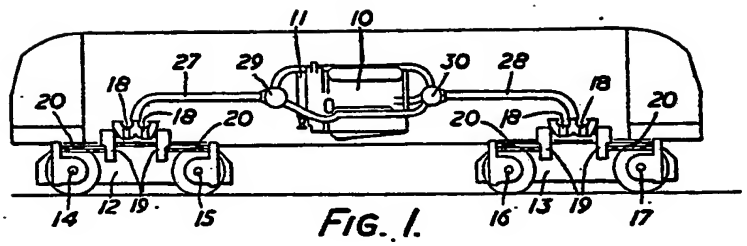

FIG. 1.

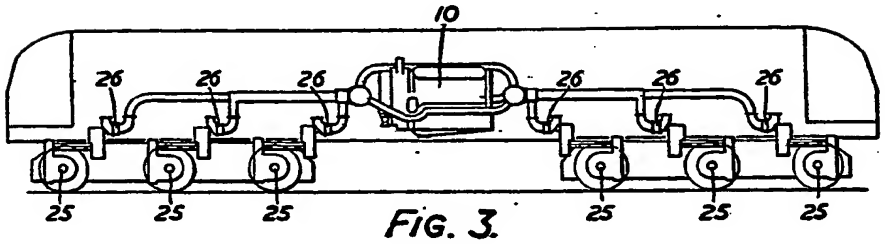

FIG. 3.

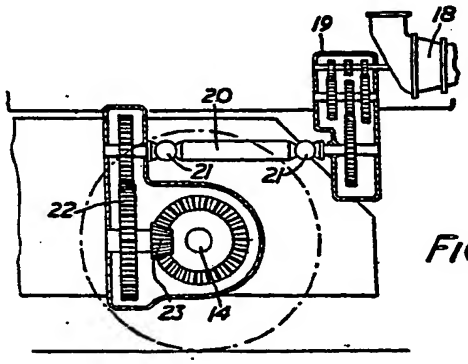

FIG. 2.